OPERATOR'S MANUAL
V-2000 Photometer
(with 50+ factory calibrations)

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Chapter 1

Introduction

1-1 Battery Installation

The V-2000 requires 4 AA alkaline or lithium batteries. With alkaline batteries, the expected life is 2,500 hours of operation. With lithium batteries, the expected life is 10,000 hours of operation. The V-2000 has a battery saving auto-shutoff feature that turns the instrument off after 20 minutes of non-use. Remove batteries when photometer is not in use.

To install batteries, carefully loosen the 2 captive screws on the battery cover (back of instrument). Remove the cover, and insert the batteries with the correct orientation as illustrated in the battery compartment. Replace the battery cover and replace the captive screws.

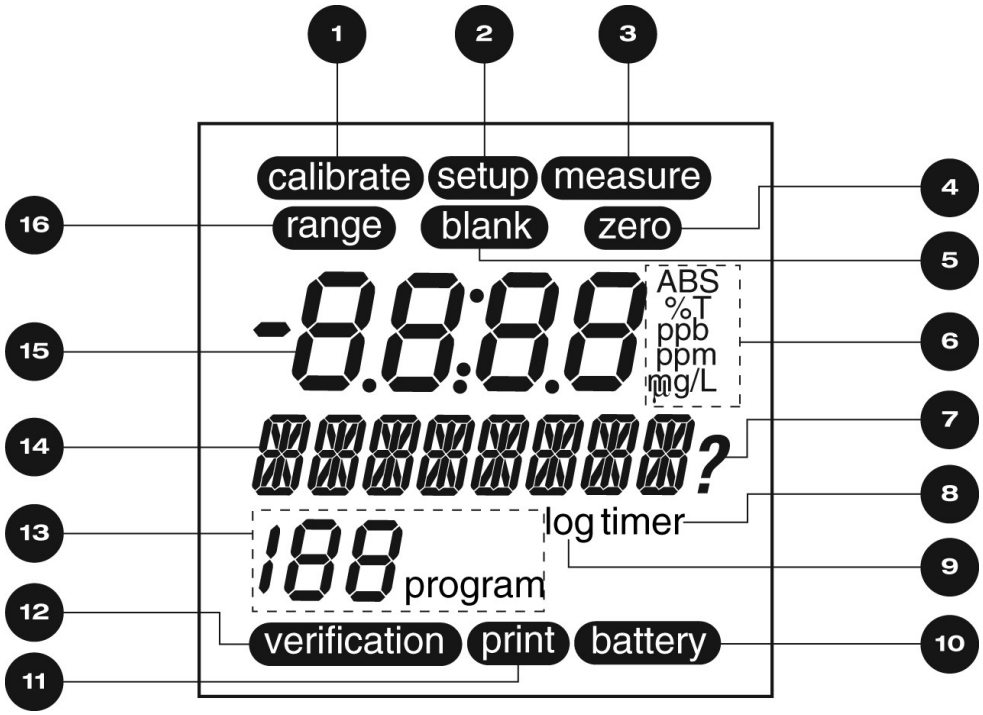
1-2 Sample Cell Adapters

The V-2000 comes with 2 sample cell adapters: 13 mm adapter for Vacu-vials; 16 mm adapter for COD Vials. The adapters ensure correct alignment of the ampoule or vial being used. If the ampoule or vial is not aligned correctly (i.e. wrong adapter or no adapter is used), measurement errors will occur.

To insert an adapter, the male tabs on the adapter (left and right sides) should be matched up with the alignment slots to the left and right of the sample cell compartment. Insert the adapter with the correct alignment and push down firmly until it snaps into place.

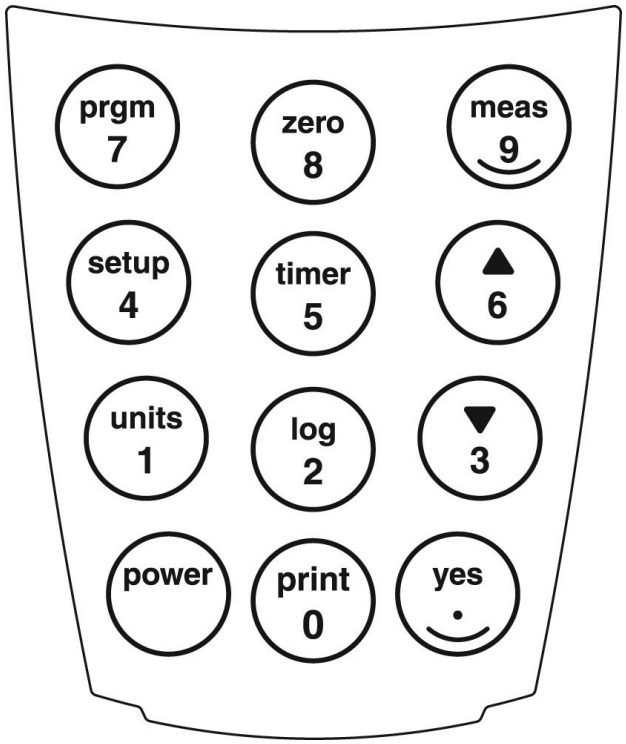
Important Note: Above the sample cell compartment, the instrument says "**cuvette adapter ◂ lock-unlock ▸**". Disregard this message! There is no lock, unlock feature to the current cell adapters. They go straight in and out. DO NOT attempt to turn the adapter from left to right when inserting it or removing it.

1-3 LCD Display



1	**calibrate**	Displays when the instrument is in the calibration mode
2	**setup**	Displays when the instrument is in the setup mode
3	**measure**	Displays when the instrument is taking a measurement
4	**zero**	Displays when the instrument is zeroing
5	**blank**	Displays when a blank is active for a selected method
6	**units**	Displays the chosen unit of measure
7	**?**	Displays when the instrument is prompting the user for a response
8	**timer**	Displays when the timer is active
9	**log**	Displays if data is stored in the log
10	**battery**	Displays if battery is low
11	**print**	Displays when the instrument is printing (or downloading)
12	**verification**	Displays when the instrument is in the verification mode
13	**XXX program**	Displays the active program number
14	⊛⊛⊛⊛⊛⊛⊛⊛	Alphanumeric display
15	-**8.8:8.8**	Numeric display
16	**range**	Displays to indicate over range condition

1-4 Keypad



KEY	FUNCTION
power	Turns the instrument on or off
print / 0	Initiates print mode or inputs a 0
yes / .	Confirms a selection, functions as Enter key, or inputs a decimal point
units / 1	Allows selection of unit of measure or inputs a 1
log / 2	Initiates data log mode or inputs a 2
▼ / 3	Scroll down or inputs a 3
setup / 4	Allows access to user selectable functions (Blank, Verify, Digits, Clock, Set Baud, Print, AutoPrint, Auto Log, Self-Test, Upload, User Prgm, Cal User) or inputs a 4
timer / 5	Initiates timer, allows access to time/date and stopwatch or inputs a 5
▲ / 6	Scroll up or inputs a 6
prgm / 7	Initiates program number input or inputs a 7
zero / 8	Initiates a zero measurement or inputs an 8
meas / 9	Initiates a measurement or inputs a 9

1-5 List of Direct Read Programs (Factory Calibrations)

Analyte	Prog. #	Kit Cat. #	Instrument Display	Cell Size, mm	Blank Y/N	Wave-length	Range ppm	Method
Aluminum	9	K-0603	ALUMINUM	13	Y	520	0 - 0.25	Eriochrome Cyanine R
Ammonia	14	K-1403	AMMONIA3	13	N	610	0 - 30.00 (as N)	Salicylate
Ammonia	15	K-1503	AMMONIA	13	N	420	0 - 7.00 (as N)	Direct Nesslerization
Ammonia	16	K-1523	AMMONIA2	13	N	420	0 - 14.0 (as N)	Direct Nesslerization
Bromine	22	K-1613	BROMINE	13	N	520	0 - 12.0	DPD
Chloride	26	K-2103	CHLORIDE	13	Y	420	0 - 40.0	Ferric Thiocyanate
Chlorine	32	K-2513	CHLOR 2	13	N	520	0 - 5.00	DPD
Chlorine	32	K-2523	CHLOR 2	13	N	520	0 - 5.00	DPD
Chlorine Dioxide	37	K-2703	CLORDIOX	13	N	520	0 - 11.0	DPD
Chromate	42	K-2803	CHROM	13	N	520	0 - 3.50 (as CrO_4)	Diphenylcarbazide
Copper	55	K-3503	COPPER	13	N	420	0 - 12.00	Bathocuproine
Cyanide	60	K-3803	CYANIDE	13	Y	610	0 - 0.400	Isonicotinic/Barbituric Acid
DEHA	64	K-3903	DEHA 1	13	N	580	0 - 2.00	PDTS
Formaldehyde	78	K-4203	FORMALD	13	N	520	0 - 8.00	Purpald
Glycol	83	K-4403	GLYCOL	13	N	520	0 - 10.0 (as EG)	Purpald/Periodate
Glycol	84	K-4423	GLYCOL 2	13	N	520	0 - 200 (as PG)	Purpald/Periodate
Hydrazine	89	K-5003	HYDRAZ	13	Y	420	0 - 1.20	PDMAB
Peroxide	93	K-5513	PEROX	13	N	520	0 - 3.00	DPD
Peroxide	95	K-5543	PEROX 2	13	N	520	0 - 6.00	Ferric Thiocyanate
Iron	100	K-6003	IRON 1	13	N	520	0 - 6.00	Phenanthroline

Analyte	Prog. #	Kit Cat. #	Instrument Display	Cell Size, mm	Blank Y/N	Wave-length	Range ppm	Method
Iron	101	K-6013	IRON 3	13	N	420	0 - 25.0	Phenanthroline
Iron	102	K-6023	IRON 2	13	N	580	0 - 2.50	PDTS
Iron	100	K-6203	IRON 1	13	N	520	0 - 6.00	Phenanthroline
Manganese	110	K-6503	MN	13	N	520	0 - 30.0	Periodate
Molybdate	115	K-6703	MOLYB	13	N	420	0 - 25.0 (as Mo)	Catechol
Nitrate	119	K-6903	NITRATE	13	N	520	0 - 1.50 (as N)	Cadmium Reduction
Nitrate	122	K-6913	NITRATE4	13	N	520	0 - 1.50 (as N)	Zinc Reduction
Nitrate	120	K-6923	NITRATE2	13	N	520	0 - 7.5 (as N)	Cadmium Reduction
Nitrate	121	K-6933	NITRATE3	13	N	520	0 - 50.0 (as NO_3)	Cadmium Reduction
Nitrite	125	K-7003	NITRITE	13	N	520	0 - 1.00 (as N)	Azo Dye Formation
COD LR, EPA Accepted	48	K-7350S K-7355	COD LR	16	Y	420	0 - 150	Dichromate Reactor Digestion
COD LR, Mercury Free	48	K-7351S K-7356	COD LR	16	Y	420	0 - 150	Dichromate Reactor Digestion
COD HR, EPA Accepted	49	K-7360S K-7365	COD HR	16	Y	610	0 - 1500	Dichromate Reactor Digestion
COD HR, Mercury Free	49	K-7361S K-7366	COD HR	16	Y	610	0 - 1500	Dichromate Reactor Digestion
COD HR+, Not EPA Accepted	49	K-7370S K-7375	COD HR	16	Y	610	0 - 15,000	Dichromate Reactor Digestion
COD HR+, Mercury Free	49	K-7371S K-7376	COD HR	16	Y	610	0 - 15,000	Dichromate Reactor Digestion
Ozone	133	K-7423	OZONE	13	N	520	0 - 5.00	DPD
Oxygen	140	K-7503	OXYGEN 1	13	N	610	0 - 2.00	Indigo Carmine
Oxygen	141	K-7513	OXYGEN 2	13	N	520	0 - 15.0	Indigo Carmine
Oxygen	142	K-7553	OXYGEN 3	13	N	520	0 - 1.000	Rhodazine D™
Peracetic Acid	148	K-7913	PERACET	13	N	520	0 - 5.00	DPD
Phenols	152	K-8003	PHENOLS	13	N	520	0 - 8.00	4-Aminoantipyrine

Analyte	Prog. #	Kit Cat. #	Instrument Display	Cell Size, mm	Blank Y/N	Wave-length	Range ppm	Method
Phenols	153	K-8023	PHENOLS2	13	N	520	0 - 20.0	4-Aminoantipyrine
Phosphate	158	K-8503	PHOS 1	13	N	420	0 - 80.0 (as PO_4)	Vanadomolybdo-phosphoric Acid
Phosphate	159	K-8513	PHOS 2	13	N	610	0 - 8.00 (as PO_4)	Stannous Chloride
Phosphate	160	K-8513	PHOS 2 P	13	N	610	0 - 2.64 (as P)	Stannous Chloride
Silica	168	K-9003	SILICA	13	N	610	0 - 10.00 (as SiO_2)	Heteropoly Blue
Sulfate	174	K-9203	SULFATE	13	N	420	0 - 100.0	Turbidimetric
Sulfide	179	K-9503	SULFIDE	13	N	610	0 - 3.00	Methylene Blue
Sulfide	180	K-9523	SULFIDE2	13	N	610	0 - 6.00	Methylene Blue
Zinc	187	K-9903	ZINC	13	N	610	0 - 3.00	Zincon
Zinc	188	K-9923	ZINC 2	13	N	610	0 - 15.0	Zincon

Chapter 2

Setup Menu Functions

To view the Setup menu functions, press the **setup** key and use the ▲ or ▼ keys to scroll through the list of functions.

2-1 Blank

The blank function is employed for specific methods that require the generation and use of a reagent blank ampoule or vial. See table in section 1-5 and the product specific instructions for methods that require the use of a reagent blank. The procedure for using the blank function is found in Chapter 3, Section 3-3 Procedure B - Zeroing, Program Selection, Setting Reagent Blank and Measuring. Detailed directions for generating a reagent blank are in the product specific instructions.

The V-2000 automatically displays the BLANK icon when the selected method requires a reagent blank.

If the blank is accidentally set (BLANK icon appears on the LCD display for a method that does not employ a reagent blank), it is important to clear the blank before running the method.

To Clear Blank:
1. Press the **setup** key and use the ▲ or ▼ keys until “BLANK” is displayed, then press the **yes** key.
2. “SET BLNK?” will be displayed.
3. Use the ▲ or ▼ keys to toggle from “SET BLNK?” to “CLR BLNK”. When “CLR BLNK” is displayed, press the **yes** key.
4. “CLEARED” will be displayed.
5. Press the **meas** key to exit the setup menu.

2-2 Verify

Disregard this function. It offers no added value to the instrument user.

2-3 Digits

The digits function allows the user to select the resolution of the reading (the number of significant digits in the displayed test result): 0.000, 0.00, 0.0, and 0. The default setting for this function is 0.000, however the test range on the parameter specific test kit instructions and in the List of Supported Parameters in Chapter 9 of this manual is displayed with the suggested number of significant digits for each particular method.

NOTE: The digits resolution setting on the V-2000 is not method specific, and therefore must be reset as needed when moving from one preprogrammed method to another.

1. Press the **setup** key and use the ▲ or ▼ keys until “DIGITS” is displayed, then press the **yes** key.
2. Use the ▲ or ▼ keys until the desired resolution is displayed, then press the **yes** key.
3. Press the **meas** key to exit the setup menu.

2-4 Clock

The clock function allows the user to set the time and date.

1. Press the **setup** key and use the ▲ or ▼ keys until “CLOCK” is displayed, then press the **yes** key.
2. “20__” will be displayed. Enter the year.
3. “__Month” will be displayed. Enter the month.
4. “__Day” will be displayed. Enter the day.
5. “__:__ (24) hour” will be displayed. Enter the time.
6. Press the **meas** key to exit the setup menu.

2-5 Set Baud

The set baud function allows the user to select the baud rate:1200, 2400, 4800, and 9600. The default setting for this function is 1200.

1. Press the **setup** key and use the ▲ or ▼ keys until “SET BAUD” is displayed, then press the **yes** key.
2. Use the ▲ or ▼ keys until the desired baud rate is displayed, then press the **yes** key.
3. Press the **meas** key to exit the setup menu.

2-6 Print

The print function allows the user to select the printout format. The user can select between a standard printout (used if printing directly to a printer) and a comma delimited format (used for importing data into a spreadsheet).

1. Press the **setup** key and use the ▲ or ▼ keys until “PRINT” is displayed, then press the **yes** key.
2. Use the ▲ or ▼ keys to toggle between “STND PRN” and “CMA DELM”. When the desired printout format is displayed, press the **yes** key.
3. Press the **meas** key to exit the setup menu.

2-7 Auto Print

The auto print function allows the user to automatically send readings to a printer.

1. Press the **setup** key and use the ▲ or ▼ keys until “AUTO PRT” is displayed, then press the **yes** key.
2. Use the ▲ or ▼ keys to toggle between “AUTO OFF” and “AUTO ON”. When the desired printing function is displayed, press the **yes** key.
3. Press the **meas** key to exit the setup menu.

2-8 Auto Log

The auto log function allows the user to automatically save **up to** 100 test results in the photometer’s memory. The procedure for using the auto log function is found in Chapter 4, Section 4-2 Logging Data Automatically.

2-9 Self-Test

The self-test function puts the photometer into self-diagnostic mode. It is not recommended as a routine test, but rather as a troubleshooting tool to be used if the unit gives an error message, produces a suspect test result or in any way malfunctions. If an instrument fails any portion of the self-test, contact CHEMetrics Technical Services Department.

1. Before initiating the self-test, the sample cell adapter must be removed and the light shield must be in place.
2. Press the **setup** key and use the ▲ or ▼ keys until “SELFTEST” is displayed, then press the **yes** key.
3. The instrument will display “KBD TEST”. Then it will prompt the user to press each of the keys beginning with the **7** key.
4. When the test is complete, the instrument should display “UNIT OK”.
5. Press any key to view the complete LCD display capabilities. Compare the instrument display to the display graphic in Chapter 1, Section 1-3 LCD Display.
6. Press any key to exit the self-test.
7. Press the **meas** key to exit the setup menu.

2-10 Upload

The upload function allows the user to update the V-2000 to the most current method version. The V-2000 is updated by logging on to the CHEMetrics website, www.chemetrics.com and clicking on “V-2000 New Method Update” under the Support tab. To ensure that the most current program calibrations are being used, it is recommended that every V-2000 user check the CHEMetrics website frequently. For more information, see Chapter 5, Section 5-3 Uploading Method Revisions.

Chapter 3

Setup and Measurement Procedures

3-1 General Operating Instructions

The following guidelines can be considered general operating instructions for the V-2000 photometer. More parameter specific information is provided in the kit instructions supplied with each Vacu-vial or COD test kit.

- The V-2000 must be zeroed prior to each series of measurements. Additionally, if the ampoule/vial adapter has been removed or comes loose during operation, the V-2000 should be re-zeroed.
    - For best results, always cover the ampoule or vial with the light shield prior to zeroing the instrument, setting a reagent blank value or measuring a sample.
    - For COD testing, LED based photometers do not produce accuracy, precision and sensitivity equivalent to that attainable from spectrophotometers. For NPDES reporting purposes for COD, a spectrophotometer is the preferred method of measurement. Range and accuracy claims for COD on different instrument platforms is available on the CHEMetrics website in the Frequently Asked Questions section under the Support tab.
    - A 13 mm sealed ampoule containing distilled water is supplied in each Vacu-vials Test Kit for use as a ZERO vial for Vacu-vial test procedures.
    - A 16 mm screw cap vial containing distilled water is supplied with the V-2000 Photometer for use as a zeroing vial for the COD test procedure.
    - Methods that do not specifically call for the generation of a reagent blank should follow **Procedure A - Zeroing, Program Selection and Measuring** below.
    - Methods that do specifically call for the generation of a reagent blank should follow **Procedure B - Zeroing, Program Selection, Setting Reagent Blank and Measuring** below.

3-2 Procedure A - Zeroing, Program Selection and Measuring

1. Install the appropriate sample cell adapter into the photometer.
2. Turn the photometer on by pressing the **power** key.

3. Insert the ZERO vial into the V-2000, cover the ZERO vial with the light shield, and press the **zero** key. “Wait” is displayed, then the result is displayed as “0.000".
   NOTE: In the total phosphate test procedure, the test vial is used to zero the V-2000.
4. Press the **prgm** key, enter the appropriate program number, then press the **yes** key. The instrument will display the appropriate method name and program number.
   NOTE: If the program number is a 3 digit number, the **yes** key does not have to be pressed.
5. Follow the parameter specific Test Procedure supplied with the Test Kit on the sample to be tested and insert the resulting test vial into the V-2000. Cover the test vial with the light shield.
6. Press **meas** key. If a color development wait time is specified in the parameter specific Test Procedure, the V-2000 timer will begin to countdown. The V-2000 will automatically proceed to the measure mode when wait time is complete. The instrument will read the test vial and display the test result. The test result can either be recorded manually, logged manually or logged automatically. The instrument displays under and over-range results only very briefly. Under and over-range results cannot be logged.
   NOTE: To bypass the timer feature, simply press the **timer** key. The instrument will immediately initiate measurement mode.

3-3 Procedure B - Zeroing, Program Selection, Setting Reagent Blank and Measuring

1. Install the appropriate sample cell adapter into the photometer.
2. Turn the photometer on by pressing the **power** key.
3. Insert the zeroing vial into the V-2000, cover the zeroing vial with the light shield, and press the **zero** key. “Wait” is displayed, then the result is displayed as “0.000".
4. Press the **prgm** key, enter the appropriate program number, then press the **yes** key. The instrument will display the appropriate method name and program number.
   NOTE: If the program number is a 3 digit number, the **yes** key does not have to be pressed.
5. Press the **setup** key and use the ▲ or ▼ keys until “BLANK” is displayed, then press the **yes** key.
6. “SET BLNK?” will be displayed, press the **yes** key.
7. “SAMPLE?” will be displayed.
8. Follow the parameter specific instructions supplied with the test kit for Generating a Reagent Blank. Insert the Reagent Blank into the V-2000. Cover the Reagent Blank with the light shield, then press the **yes** key. The instrument will read the blank, display an absorbance value momentarily, and then move to the next setup function.
9. Press the **meas** key to exit the setup menu. The instrument display will return to the appropriate method name and program number.
10. Follow the parameter specific Test Procedure supplied with the test kit on the sample to be tested, and insert the resulting test ampoule or vial into the V-2000. Cover the test ampoule with the light shield.
11. Press the **meas** key. If a color development wait time is specified in the parameter specific Test Procedure, the V-2000 timer will begin to countdown. The V-2000 will automatically proceed to the measure mode when wait time is complete. The instrument will read the test ampoule or vial and display the test result. The test result can either be recorded manually, logged manually or logged automatically. The instrument displays under and over-range results only very briefly. Under and over-range results cannot be logged.
    NOTE: To bypass the timer feature, simply press the **timer** key. The instrument will immediately initiate measurement mode.

Chapter 4

Data Logging

The V-2000 allows the user to store **up to** 100 test results in the photometer's memory.

4-1 Logging Data Manually

When a test result is being displayed by the instrument, press the **log** key. The log icon will appear in the display. The V-2000 will display "1 LOGGED". As new test results are logged, the number preceding LOGGED will append to reflect the number of saved test results.

4-2 Logging Data Automatically

Auto log automatically saves test results to the photometer's memory.

1. Press the **setup** key and use the ▲ or ▼ keys until "AUTO LOG" is displayed, then press the **yes** key.
2. Use the ▲ or ▼ keys to toggle between "AUTO OFF" and "AUTO ON". When the desired function is displayed, press the **yes** key.
3. Press the **meas** key to exit the setup menu.
4. With auto log turned on, the log icon will appear in the display. After the first data point is logged, the V-2000 will display "1 LOGGED". As new test results are logged, the number preceding LOGGED will append to reflect the number of saved test results.
   NOTE: Under and over-range results are not logged.

4-3 Displaying the Log

1. Press and hold the **log** key for approximately 4 seconds.
2. "DISPLAY" will be displayed and the last test result saved into the log will be displayed.
3. Use ▲ or the ▼ keys to scroll through the log test results.
4. Press the **meas** key to escape log display.

4-4 Clearing the Log

1. Press and hold the **log** key for approximately 4 seconds.
2. Press the **zero** key; "CLR LOG?" will be displayed.
   NOTE: It is recommended to print or download the log prior to clearing.
3. Press the **yes** key to clear the log. "DELETED" will be displayed and the V-2000 will return to the measurement mode.

Chapter 5

Use with Printers and Computers

The V-2000 photometer allows communication directly to a printer or bidirectional communication with a computer.

Connecting to a printer or a computer requires the use of the supplied RS-232 serial cable. This cable has a special 3-pin connector on one end for the V-2000. The RS-232 port is on the underside of the instrument. When connecting the RS-232 cable to a computer, a serial connector may be required (a 25 pin to 9 pin adapter is included with the V-2000). If your computer does not have a serial port, you will need to purchase a separate adapter that will allow you to connect the V-2000 RS-232 serial cable to the USB port on your computer. See Section 9-1 for ordering information.

5-1 Printing Logged Data Directly to a Printer

1. With the V-2000 power off, connect the V-2000 to a printer using the supplied RS-232 serial cable.
2. Press the **power** key.
3. Press the **setup** key and use the ▲ or ▼ keys until “PRINT” is displayed, then press the **yes** key.
4. Use the ▲ or ▼ keys to toggle between “STND PRN” and “CMA DELM”. When “STND PRN” is displayed, press the **yes** key.
5. Press the **meas** key to exit the setup menu.
6. Press and hold the **log** key for approximately 4 seconds.
7. Press and hold the **print** key for approximately 4 seconds to download all saved data.

5-2 Downloading Logged Data to a Computer

Logged data can be sent to a terminal emulator program (example: Hyper Terminal) and then exported to a spreadsheet or database software application.

1. Create a text file (*.txt) to receive the V-2000 logged data. Close this file.
2. With the V-2000 power off, connect the V-2000 to a computer using the supplied RS-232 serial cable.
3. Press the **power** key.
4. Press the **setup** key and use the ▲ or ▼ keys until “PRINT” is displayed, then press the **yes** key.
5. Use the ▲ or ▼ keys to toggle between “STND PRN” and “CMA DELM”. When “CMA DELM” is displayed, press the **yes** key.
6. Press the **meas** key to exit the setup menu.
7. Open HyperTerminal by going to the Start button, then clicking on Programs/ Accessories/Communications/HyperTerminal.
8. A “New Connection” window will open. Enter a name to call the terminal program, for example, “V2000". Select an icon to represent the terminal program.
9. A “Connect To” window will open. Select the Com (serial) port to which V-2000 is connected.

10. Enter the port transmission settings:

Baud Rate	1200, 2400, 4800, 9600
Data Bits	8
Parity	None
Stop Bit	1
Start Bit	1
Flow Control	Hardware

NOTE: The baud rate selected in Hyper Terminal must match the V-2000 baud rate. See Chapter 2, Section 2-5 Baud Rate.

11. From the HyperTerminal menu, select Transfer. Click on Capture Text. Enter the path and name of the file created in Step 1. Click on Start.
12. Make sure that the desired V-2000 printout format has been chosen as outlined in Chapter 2, Section 2-6 Print.
13. Press and hold the **log** key for approximately 4 seconds.
14. Press and hold the **print** key for approximately 4 seconds to download all saved data.
15. Log #, test results, program #, parameter, and date/time tag should appear in the Hyper Terminal window. When transmission is complete, click the Disconnect icon. Click on Transfer/Capture Text and Stop. Exit the HyperTerminal program.
16. The text file which captured the V-2000 data can now be opened in the appropriate software application. Data may be reformatted as needed for spreadsheet or database manipulation.

5-3 Uploading Method Revisions

The V-2000 method version can be updated by logging onto the CHEMetrics website, www.chemetrics.com and clicking on “V-2000 Upload New Method Update” under the Support tab. The CHEMetrics website will inform customers when new programs are available or existing programs have been updated. Also, the product specific test kits will have information about method updates as they occur. To ensure that the most current program calibrations are being used, it is recommended that every V-2000 user check the CHEMetrics website frequently.

To determine which method revision is currently present on your V-2000 instrument, simply turn the instrument on. On start up, the V-2000 briefly displays the current method revision.

Note: Uploading a new method revision does not overwrite any user generated custom methods.

Method Revision Update Instructions:

1. With the V-2000 power off, connect the V-2000 to a computer using the supplied RS-232 serial cable.
2. Press the power key to turn the meter on.
3. Then press the setup key.
4. Press the ▲ or ▼ keys until “UPLOAD” is displayed, then press the yes key to accept.
5. Meter should read “WAITING”, indicating meter is ready for the Method Revision Update.

   NOTE: To abort the upload process, press yes key again.

6. Click on the link provided on the CHEMetrics website and open the program.
7. Follow the instructions provided in the file.
8. When the program is complete, the instrument will briefly display “ALL DONE” along with the new method revision number.

   NOTE: If the above Method Revision Update does not complete successfully, contact CHEMetrics Technical Support at 540-788-9026 or technical@chemetrics.com.

Chapter 6

Error Messages

Error code	Explanation
E11, 420 LOW, 420 HIGH	420 nm LED Failure
E12, 520 LOW, 520 HIGH	520 nm LED Failure
E13, 580 LOW, 580 HIGH	580 nm LED Failure
E14, 610 LOW, 610 HIGH	610 nm LED Failure
E19	LCD Driver Error
OVERRNG	Over-range: Test result is more than 110% above claimed operational range; dilute that sample and repeat the test
UNDRRNG	Under-range: Test result is less than zero.

Chapter 7

Custom User Programs

The V-2000 offers the user the option of taking readings in absorbance or % Transmittance at each of the 4 available wavelengths (program numbers 1 - 4). Absorbance readings can then be used to generate a user specific custom method.

The V-2000 offers the user the ability to store up 10 user specific custom methods.

Program Number	Designation
0	manual zeroing; equivalent to using the **zero** key
1	420 nm absorbance or % Transmittance
2	520 nm absorbance or % Transmittance
3	580 nm absorbance or % Transmittance
4	610 nm absorbance or % Transmittance
190-199	user generated custom methods

7-1 Creating a Custom User Program

1. Install the appropriate sample cell adapter into the photometer.
2. Turn the photometer on by pressing the power key.
3. Insert the zeroing vial into the V-2000, cover the zeroing vial with the light shield, and press the zero key. “Wait” is displayed, then the result is displayed as “0.000".
4. Press the prgm key, enter the desired program number (190 -199 only), The instrument will display “No User X” if no user program is currently stored at that location.
5. Press the setup key and use the ▲ or ▼ keys until “USR PRGM” is displayed, then press the yes key.
6. “WAVELENGTH?” will be displayed. Use the ▲ or ▼ keys to select the desired wavelength. When the desired wavelength is displayed, press the yes key.
7. “UNITS” will be displayed. Use the ▲ or ▼ keys to select the desired units. When the desired units are displayed, press the yes key.
8. “TIMER 1” will be displayed. Press the yes key to set the first timer, then use the ▲ or ▼ keys to select the desired length of time (10 second intervals). When the desired length of time is displayed, press the yes key.
9. “TIMER 2” will be displayed. Press the yes key to set the second timer, then use the ▲ or ▼ keys to select the desired length of time (10 second intervals). When the desired length of time is displayed, press the yes key.
10. “SAVE USR ?” will be displayed. Press the yes key to save the new user program. “—SAVED—“ will be displayed. The instrument will automatically proceed to “CAL USR”.

7-2 Calibrating a Custom User Program

A calibration must be entered to use a new custom user program. Calibrating a user program requires a minimum of 2 calibration standards, selected to bracket the anticipated sample concentration. However, the V-2000 will accept up to 5 calibration standards which cover the expected range of the test.

1. Follow the parameter specific Test Procedure to generate 2 to 5 fully reacted test vials for the selected standard concentrations.
2. While “CAL USR” is displayed, press the yes key.
3. “3 CAL PTS?” will be displayed. Use the ▲ or ▼ keys until the desired number of calibration points is displayed, then press the yes key.
4. “PT1 CONC?” will be displayed. Insert the first reacted standard into the V-2000 and cover it with the light shield. Enter the value for the first standard using the numeric keypad. Press the yes key to accept the value entered. The V-2000 will read the first standard and automatically proceed to the next standard.

   NOTE: If no decimal point is used in the concentration value, press the yes key again to accept the value.

5. Repeat Step 4 for each of the remaining standard concentrations.
6. “CAL OK” will be displayed at the completion of the calibration.

7-3 Replacing or Reviewing a Custom User Program

1. Install the appropriate sample cell adapter into the photometer.
2. Turn the photometer on by pressing the power key.
3. Insert the zeroing vial into the V-2000, cover the zeroing vial with the light shield, and press the zero key. “Wait” is displayed, then the result is displayed as “0.000".
4. Press the prgm key, enter the desired program number (190 -199 only), The instrument will display “No User X” if no user program is currently stored at that location or “**USR X” if a program is stored at that location.
5. Press the setup key and use the ▲ or ▼ keys until “USR PRGM” is displayed, then press the yes key.
6. If a stored user program exists, “REPL OLD?” will be displayed. Use the ▲ or ▼ keys to toggle between “REPL OLD?” and “REVIEW?”. To view program settings, press the yes key to select “REVIEW?”. To replace the existing program or change certain settings, press the yes key to select “REPL OLD?”.

Chapter 8

Specifications & Features

Direct Read Programs	50+
Wavelength (nm)	420, 520, 580, 610
Wavelength Accuracy	± 2 nm
Wavelength Selection	Automatic
Photometric Reproducibility	± 0.005A (0-1A)
Photometric Accuracy	± 0.005A @ 1.0 Abs Nominal
Photometric Range	0 - 2 A
Light Source	Light Emitting Diode (LED)
Detector	Photodiode
Bandwidth	10 ± 2 nm
Operating Temperature	0.0 to 45.0 °C
Humidity	90% at 50.0 °C max
Waterproof	IP67
Cell Adapter(s)	16 mm, 13 mm
Output Units	mg/L, ppm, µg/L, ppb, g/L, Absorbance, or % Transmittance
Datalogging	100 points, Date and Time Tag
Download Capability	Data to Spreadsheet and Printer, RS232 Output
Upload Capability	Methods Update, RS232 Input
Power Supply	4 AA Alkaline Batteries
Compliance	European CE Mark
Timing Capability	Built-in Timer

Chapter 9

Product Information

9-1 Instrument & Accessories

Catalog Number	Description
V-2000	V-2000 Photometer, *comes with 13 mm sample cell adapter (installed), 16 mm sample cell adapter, COD ZEROING Vial, RS-232 cable, serial connector, light shield, operator's manual, 4 alkaline AA batteries.*
A-0182	V-2000 Carrying case, *hard plastic kit case with handle and foam insert that holds V-2000 Photometer and up to 4 Vacu-vials Test Kits.*
A-0183	COD ZEROING Vial, *package of one*
A-0188	Sample Dilution Kit, to extend the kit ranges on the V-2000, *equipment to perform 30 sample dilutions (10X, 125X, 250X, 500X, 1000X and 5000X). Not applicable to Oxygen or Ozone analysis.*
A-0190	*Canvas Tote Bag, soft canvas bag with shoulder strap and multiple pockets that hold V-2000 Photometer and up to 4 Vacu-vials Test Kits.*
A-0305	*RS232 (9 pin) to USB cable adapter, package of one.*

9-2 Warranty Information

The V-2000 Photometer, other than its expendable components (sample cell adapters, light shield, RS-232 cable and serial connector), carries an unconditional guarantee of freedom from defects in material and workmanship for a period of two years from date of shipment. User access to the interior of the instrument may impair its function and will void this warranty. Improper use, application or servicing also voids this warranty. Manufacturer's liability shall not exceed cost of replacement of the photometer.

9-3 European Union's WEEE Directive 2002/96/EC

This product is required to comply with European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the WEEE symbol. For information on recycling this instrument, contact the instrument distributor.

Marking of electrical and electronic equipment, which applies to electrical and electronic equipment falling under the Directive 2002/96/EC (WEEE) and the equipment that has been put on the market after 13 August 2005.